

EVALUATION

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- Purpose(s) and Types of Evaluation ◀
- Evaluation Instrument Development Principles ◀
- Cognitive Test Item Development ◀
- Affective and Psychomotor Test Item Development ◀
- Getting Started—Create Your Own Evaluation Instrument(s) ◀

OVERVIEW



Suggested instructional time for this lesson: 2 hours

Introduction

The goal of all instruction is to raise the students' demonstrated understanding or performance. How does a student demonstrate understanding? How do we, as instructors, measure performance? The purpose of this lesson is to give you some background in evaluation methods and then help you to acquire the skills you need to develop effective evaluation instruments yourselves. In this lesson, you will create evaluation instruments that will be part of your lesson presentation package at the end of this course.

Lesson Objectives

Through group discussion, question and answer sessions, and individual activities, the EMS instructor trainee should be able to:

- State two purposes for evaluation
- Define the concepts of validity and reliability
- List five types of test item types for measuring cognitive objectives.

Using the revised objectives for their EMT-Basic lesson, the EMS instructor trainee should be able to:

- Use the rules of development for various test item types to develop evaluation instrument(s) that effectively measure student achievement of the lesson objectives.

Materials Needed

- Overhead projector and screen
- Flipchart (prepared objectives)
- Appendix B
- Flipchart and markers

Instructional Strategies

- Lecture
- Discussion
- Question and answer
- Activities
- Visual aids

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Lesson Objectives

I. Purposes of Evaluation

- A. Measure effectiveness of instruction
- B. Measure participant performance
 - 1. Formal methods

FORMAL EVALUATION METHODS

- Structured
- Written tests, practical exams
- Formal assessment of student mastery of objectives

ADDITIONAL INFORMATION

I. Purposes of Evaluation

Evaluation should be a continuous, planned process during course development as well as after course completion. There are several types of evaluation that we will cover in this lesson that serve multiple purposes in the instructional development and implementation process.

A. Measure effectiveness of instruction

It is important to remember that the primary goal of all evaluation is to provide instructors with the necessary information required to make the instruction as effective as possible in order to graduate the most highly trained students possible.

Evaluation of student performance provides a method of determining where there are weaknesses in the instruction. If students are having difficulty with assignments or passing tests, it may indicate problems with your objectives, instructional strategies, and/or your assumptions of the entry-level knowledge or skills of your students.

B. Measure participant performance

Evaluation is a mechanism of determining student progress toward, or the attainment of cognitive, affective, and psychomotor objectives. The methods of evaluation used can be either *formal* or *informal*.

1. Formal methods

Formal methods of evaluation refer to structured instruments, such as written tests or practical exams that are used to assess student attainment of learning objectives both during and after training.

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2. Informal methods

INFORMAL EVALUATION METHODS

- Less structured
- Assignments, exercises, question and answer
- Provide corrective feedback, practice opportunity
- Informal assessment of student mastery of objectives

Evaluation

3. Pretest/posttest comparison

4. Surveys and questionnaires

5. Peer review and observation

ADDITIONAL INFORMATION

2. Informal methods

Informal methods of evaluation refer to less structured means of assessing student achievement of learning objectives, such as student assignments, exercises, oral quizzes, or question and answer sessions, primarily to provide corrective feedback to the student.

3. Pretest/posttest comparison

Administering both a pretest before the course begins and a posttest covering the same material after the course ends is another method of determining how effective the instruction was. A comparison of test scores shows how much performance has improved, and a comparison of performance on individual test items shows where there are weaknesses in the instruction.

4. Surveys and questionnaires

In addition, assessments of the effectiveness of instruction can be gathered through the use of surveys or questionnaires administered during or at the conclusion of training. These surveys primarily evaluate students' reaction to the instruction. A sample of this type of survey used with the Instructor Training Course is provided in Appendix B.

5. Peer review and observation

Peer review can take place during the development of instruction as well as during the actual instruction. Guidelines or checklists covering the areas that you want the peer review or observation to focus on should be provided to those involved.

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II. Evaluation Instrument Development Principles

- A. Must be based on objectives
- B. Must be valid

DEFINITION OF VALID

Valid means that the instrument measures what you intend it to measure

Evaluation

ADDITIONAL INFORMATION

II. Evaluation Instrument Development Principles

A. Must be based on objectives

Your learning objectives drive evaluation instrument construction. Cognitive, or knowledge-based objectives are best evaluated by written or oral tests. Affective and psychomotor objectives are more accurately measured by practical/performance exams or by observation.

For example, if you want to know if a student can apply emergency care to a superficial burn victim, then the student should be evaluated actually performing the emergency care steps in a simulated emergency situation.

B. Must be valid

As you develop and refine your evaluation instruments, it is important to ensure that they are both *valid* and *reliable*. Valid means that the instrument measures what you intend it to measure. Basing your evaluation instruments on learning objectives helps ensure that your evaluation instrument is valid. The question to ask yourself to determine whether your evaluation instrument is valid is "Do these items measure the behaviors, conditions, and standards stated in my objectives?" For example, if an objective states "Demonstrate completing a prehospital care report for patients with musculoskeletal injuries" then the test is clear: "Here is a prehospital care report; complete it for a patient with the following specified musculoskeletal injuries."

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C. Must be reliable

DEFINITION OF RELIABLE

**Reliable means that the instrument will
yield consistent results over time**

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D. Must be based on learning domain

ADDITIONAL INFORMATION

C. Must be reliable

A reliable evaluation instrument means that it will yield consistent results over time. In other words, if you administer the same practical exam under the same conditions with several classes of students with similar knowledge and experiences, the results should be similar each time it is given.

D. Must be based on learning domain

There are many different question types that you can use to develop formal evaluation instruments that will measure the degree of mastery of your cognitive, affective, and psychomotor objectives. We will review the most common types, along with guidelines to follow in creating each type.

III. Cognitive Test Item Development

- A. Written and oral tests
- B. Multiple choice questions
 - 1. Stem and distractors

MULTIPLE CHOICE QUESTION EXAMPLE

The structure containing the vocal chords is the:

- a. larynx
- b. epiglottis
- c. trachea
- d. pharynx

ADDITIONAL INFORMATION

III. Cognitive Test Item Development**A. Written and oral tests**

Cognitive, or knowledge-based objectives are best evaluated by written or oral tests. The advantages of written examinations are that they:

- Can be used efficiently with large numbers of students
- Provide better for consistent scoring

The advantages of oral exams are that they:

- Can evaluate "quick thinking" or reactions
- Can be evaluated by multiple listeners simultaneously

Whether you use written or oral tests should depend primarily on the real-world conditions under which the student will be expected to apply the learned material.

B. Multiple choice questions

Multiple choice questions are the most common type of written test question used in the EMT community. Multiple choice questions are useful for testing a student's ability to recognize or recall information.

1. Stem and distractors

A multiple choice question is made up of two parts, the *stem* which is the question, and the *distractors*, which are the possible answers. For example:

- The structure containing the vocal chords is the:
 - a. larynx
 - b. epiglottis
 - c. trachea
 - d. pharynx

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2. Rules for development
- C. Group Activity 7.1 - Multiple Choice Questions
 1. Small groups
 2. Choose lessons
 3. Create multiple choice questions
 4. Post flipchart pages and review

ADDITIONAL INFORMATION

2. Rules for development

Rules for developing the stem are as follows:

- State briefly and clearly.
- Address only one problem or concern per question.
- State as a question or incomplete sentence.
- Use positive rather than negative statements.
- Include as much information in the stem as possible, rather than repeating the same term(s) in the distractors.
- End the stem with "a(n):" if one or more distractors begins with a vowel sound; otherwise end the stem with "a:".

Rules for developing the distractors are as follows:

- Include one choice that is clearly the best.
- Use words and phrases drawn from the instructional material that could be plausible alternatives to the correct answer.
- Distractors should be approximately equal in length and with parallel structure, e.g., all nouns, verbs, phrases.
- Distractors should not be synonymous.
- Use discretion when including humorous distractors. If used, they should be viable distractors as well as being clever.

C. Activity 7.1

1. Divide students into small groups or pairs.
2. Ask groups to review the lesson objectives from Lessons 1 - 7 of the Instructor Training Course.
3. Ask groups to take 20 minutes to create as many multiple choice questions as possible on flipchart paper from the lesson objectives.
4. Post flipchart pages and review for correctness by comparing each question to its objective and the rules for developing multiple choice questions.

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D. True/false questions

1. Example

TRUE/FALSE QUESTION EXAMPLE

**A multi-car crash has been reported.
The primary consideration in selecting
a route to the scene is speed.**

2. Rules for development

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E. Fill-in-the-blank questions

1. Example

FILL-IN-THE-BLANK QUESTION EXAMPLE

The visual check of the vehicle and surrounding area prior to operating the ambulance is called the egress check.

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2. Rules for development

ADDITIONAL INFORMATION

E. Fill-in-the-blank questions

Fill-in-the-blank questions are best for testing a student's knowledge of specific terms.

1. Example

- The visual check of the vehicle and surrounding area prior to operating the ambulance is called the egress check.

2. Rules for development

- Do not use fill-in-the-blank questions if the response is so general that many common words could be considered correct.
- Make the blank line about four to six spaces longer than the longest acceptable answer.
- If the blank is preceded by a "a" or "an", use "a(n)" so that you do not give away whether the answer begins with a vowel or a consonant.
- Let students know how many words are in the answer (or if the answer is a number) by indicating this information in parentheses at the end of the question, e.g., "(number)" or "(two words)".

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F. Matching questions

1. Example

MATCHING QUESTION EXAMPLE

Match each city with its football team:

- | | |
|-----------------|-------------|
| ___ New York | a. Bills |
| ___ Buffalo | b. Raiders |
| ___ Washington | c. Giants |
| ___ Los Angeles | d. Redskins |

2. Rules for development

ADDITIONAL INFORMATION

F. Matching questions

Matching questions are good for testing a student's ability to classify information.

1. Example

- Match each city with its football team:

___ New York	a. Bills
___ Buffalo	b. Raiders
___ Washington	c. Giants
___ Oakland	d. Redskins

2. Rules for development

- The set of matching items and responses should consist of three to eight items.
- There can be an equal number of items in each column or more responses than items.
- For ease of student answering and instructor grading, the items and responses should all be on one page.
- All items and responses should be within the same system or organization.

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G. Essay questions

1. Example

ESSAY QUESTION EXAMPLE

Explain the importance of effective communication of patient information in the verbal report.

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2. Rules for development

ADDITIONAL INFORMATION

G. Essay questions

Essay questions are most appropriate for testing higher level cognitive objectives, such as synthesis or evaluation. Essay questions can also be used to assess some types of affective objectives.

1. Example

- Explain the importance of effective communication of patient information in the verbal report.

2. Rules for development

- Write specific questions that can be answered briefly.
- Prepare an answer key with all the important details you expect students to cover.
- If possible, have students use code numbers rather than their names to decrease scorer bias.
- If there are multiple essay questions, score all papers on the first question before going on to the second.

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IV. Affective and Psychomotor Test Item Development

A. Affective objective example

AFFECTIVE OBJECTIVE EXAMPLE

Demonstrate the appropriate behaviors involved in trying to persuade a patient to go to a hospital after he/she has refused treatment.

Evaluation

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ADDITIONAL INFORMATION

IV. Affective and Psychomotor Test Item Development

Affective and psychomotor objectives are more accurately measured by practical/performance exams or by observation. Evaluation instruments for these two domains of learning usually take the form of checklists, rating scales, and skill sheets.

A. Affective objective example

An example of an affective objective that could be evaluated through the use of a checklist or rating scale in a role-play situation is as follows:

- Demonstrate the appropriate behaviors involved in trying to persuade a patient to go to a hospital after he/she has refused treatment.

In order to evaluate a student's mastery of this objective, a checklist of behaviors to be exhibited and actions to take in the situation described should be documented. This list would be used by observers to rate the performance of the student in a role-play scenario.

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B. Psychomotor objective example

PSYCHOMOTOR OBJECTIVE EXAMPLE

**Demonstrate the use of an epinephrine
auto-injector.**

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C. Rules for development

ADDITIONAL INFORMATION

B. Psychomotor objective example

An example of a psychomotor objective that could be evaluated through the use of a skill sheet is as follows:

- Demonstrate the use of an epinephrine auto-injector.

The skill sheet used to evaluate this objective in the EMT-Basic Course is shown in Appendix B.

C. Rules for development

- Steps are described independently of each other and listed in the order in which they should be performed.
- Steps are independently observable and measurable.
- The minimum number of steps necessary to complete the task are included.
- Assign different point values to each step if some are more important or more difficult than others.
- Each evaluator understands scoring criteria.

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D. Characteristics of valid and reliable performance evaluations

VALID AND RELIABLE EVALUATION TOOLS

- Objectivity
- Replicability
- Fairness
- Realism

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E. Individual Activity 7.2 - Evaluation Instruments

1. Refer students to assigned EMT-Basic revised objectives.
2. Begin developing test items for use in Lesson Plan Development Lesson.

V. Summary

ADDITIONAL INFORMATION

D. Characteristics of valid and reliable performance evaluations

In addition to the rules stated above for developing practical/performance evaluation tools, be sure to consider the following characteristics in developing and administering performance checklists, rating scales, and skill sheets:

- **Objectivity.** Is the instrument objective in what it is attempting to measure? Is the observer objective?
- **Replicability.** Does the instrument measure similar performances across students? Across classes? Across locations?
- **Fairness.** Are the standards known by the students in advance of testing? Has practice been provided with similar instruments and scenarios during training?
- **Realism.** Is the situation under which the students are being tested plausible? Are external distractions realistic? Is the stress level similar to that in the field environment?

Remember that you are evaluating performance, not the student. When using checklists and rating scales, be sure that your individual biases regarding students do not enter into your evaluation of performance.

E. Activity 7.2 - Evaluation Instruments

Instructor trainees should refer to the revised objectives from the EMT-Basic lesson they were assigned for final presentations. The students should begin developing test items which could be used to measure student performance against the objectives. If time does not permit completion of the test items, students can finish them in the Lesson Plan Development Lesson.

V. Summary

This lesson presented information on the purposes and types of evaluation instruments as well as the principles to consider when developing evaluation instruments. It also addressed the various test item types to be used to evaluate cognitive, affective, and psychomotor objectives. The importance of valid and reliable evaluation instruments was covered. Practice was provided in developing various question types based on lesson objectives.

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References

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References

Glasgow, Zita; Schumacher, Sanford. "Handbook for Designers of Instructional Systems" Preliminary printing by Applied Science Associates of a Technical Report to be published by the Air Force Human Resources Laboratory. Wright Patterson Air Force Base, Ohio. 1974.

Heinich, Robert; Molenda, Michael, et.al. "Systematic Planning for the Use of Media" *Instructional Media (Fourth Edition)*. Macmillan Publishing Company. New York. 1993.

Herman, Joan L. (Ed.), *Program Evaluation Kit (Second Edition)*. Sage Publications. Newbury Park, California. 1987.

A set of books intended to assist the user in conducting program evaluation. Useful for experienced and novice program evaluators, each book contains step-by-step procedural guides, real-life examples, and vocabulary definitions. Books in the set include: The Evaluator's Handbook, How to Focus an Evaluation, How to Design a Program Evaluation, How to Use Qualitative Methods in Evaluation, How to Assess Program Implementation, How to Measure Attitudes, How to Measure Performance and Use Tests, and How to Analyze Data.

Mager, Robert F. "Measuring Instructional Results (Second Edition)" *The New Mager Six-Pack*. Lake Publishing Company. Belmont, California. 1984.

Mager, Robert F. "Preparing Instructional Objectives" *The New Mager Six-Pack*. Lake Publishing Company. Belmont, California. 1988.

Silberman, Mel. "Developing Active Training Objectives" *Active Training*. Lexington Books. New York, New York. 1990.